

REMARKS

Claims 11-18 and 20-31 are pending herein. By this Amendment, claims 11-13, 20 and 27-31 are amended.

No new matter is added by this Amendment. Support for the claim amendments can be found in the specification at, for example, page 2, lines 8-11, page 2, line 22 through page 3, line 1 and page 17, lines 10-14.

The attached Appendix includes a marked-up copy of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

I. Rejection Under 35 U.S.C. §102(e)

Claims 11-18 and 20-31 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,004,402 (hereinafter Cercone). This rejection is respectfully traversed.

The invention of amended claim 11 is characterized by a polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a mirror polishing process, wherein a content of zinc oxide (ZnO) included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad.

As described on page 1, line 21 through page 4, line 9 of the present specification, methods for processing a semiconductor wafer have generally included performing a slicing step, a chamfering step, a lapping step, etc., and then performing a mirror-polishing step for mirror-surfacing a chamfered portion and main surface of a wafer. As for the mirror-polishing step, a non-uniformity of surface roughness, a cloudiness (haze), and the like are likely to remain on the wafer following the early stages of polishing. Accordingly, a finish polishing process is finally performed so that the non-uniformity of surface roughness which remains on the wafer surface is eliminated to obtain an entire mirror-polished wafer.

However, as described on page 14, line 9 through page 15, line 8 of the present specification, the inventors of the present invention found that when the mirror-polishing process is performed, minute damages may be generated on the wafer polished by a conventional polishing pad, and discovered that the damages are caused by zinc compounds (ZnO) added to a polishing pad in the manufacturing thereof. Consequently, as described on page 8, lines 9-16 of the present specification, if the polishing pad, in which the content of zinc compounds included is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad as claim 11, is used in a mirror-polishing process, the polishing damages can be suppressed, and accordingly the wafer having almost no problem in the subsequent device fabrication process can be manufactured.

On the contrary, Cercone describes at column 1, lines 26-33 that conventional sponges shaped in various forms, such as rollers and pads, have been used to clean semiconductor wafers, etc., and that residue in the sponge is reduced to 2ppm or less, preferably 1ppm or less for many elements, zinc and calcium in particular. See column 2, lines 21-23. Table 2 in column 5 and Table 4 in column 6 show contents of various elements in sponges, and indicate that the sponges of Cercone contain zinc concentrations of 0.07ppm or 0.04ppm. Therefore, the sponge of Cercone is similar to the polishing pad of the present invention only in that the zinc concentration is low.

However, the sponge of Cercone is a sponge used to clean wafers, as described at column 1, lines 18-24, and is not a polishing pad used to mirror-polish wafers as in the present invention. The sponge of Cercone is used for removing polishing agent and polishing sludge which remain on the wafer surface after the mirror polishing. Therefore, it is natural that in order to prevent impurities from adhering to a wafer surface by finally cleaning the wafer surface, the sponge for cleaning of Cercone is kept from containing the other metallic component (contaminants) in addition to zinc and calcium as much as possible, as shown in

Tables 2 and 4 therein. However, such a sponge for cleaning completely differs from the polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a mirror polishing process. The sponge for cleaning of Cercone cannot be used for polishing a semiconductor wafer.

For example, the polishing pad according to the present invention has a flat shape as shown in Figures 2 and 3. On the other hand, the sponge according to Cercone typically has a cylindrical body and truncated conical projections formed on its surface as shown in Figures 1-3 and described in column 3, lines 31-61. The sponge having such a shape obviously differs from a polishing pad, and it cannot be used for polishing a wafer in a mirror-polishing process to make the wafer flat with high precision so as to have a mirror-polished surface.

Moreover, as for materials, as described on page 4, lines 10-25 of the present specification, for example, a polishing pad which comprises a foamed urethane sheet or a nonwoven fabric such as polyester is used in the mirror-polishing process. See claims 14-16, 20 and 22-26 of the present application. On the other hand, in Cercone, as described at column 1, lines 26-29, column 2, line 15 and claim 1, the sponge for cleaning is made of polyvinyl acetal.

As described above, the polishing pad according to claim 11 of the present application completely differs from the sponge for cleaning of Cercone in regard to both shape and material. Although the shape and material of the polishing pad of claim 11 of the present application is not limited, claim 11 is amended to recite "a polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing-pad." The claimed polishing pad thus is clearly distinguished from the sponge for cleaning of Cercone which does not have the property of being used with a polishing agent as recited in the present

claims. Accordingly, the polishing pad of claim 11 of the present application clearly is not taught, and therefore not anticipated, by the sponge for cleaning of Cercone.

Also, since claims 12-18 and 20-31 also relate to a polishing pad or a method for polishing a semiconductor wafer while supplying a polishing agent onto a polishing pad as in claim 11 of the present application, these claims also are not taught by Cercone for the same reasons discussed above.

Consequently, Cercone does not anticipate claims 11-18 and 20-31 under 35 U.S.C. §102(e).

In addition, nothing in Cercone would have rendered the claimed invention obvious to one of ordinary skill in the art. The sponge for cleaning of Cercone cannot be applied to the mirror-polishing of a wafer because of the difference of the shape and material as aforementioned. Moreover, as for zinc, etc. in the sponge, at column 4, lines 51-52, Cercone only describes that reducing the values of extractable calcium and zinc is particularly important, but neither teaches nor suggests that zinc compounds contained in a polishing pad can cause the generation of polishing damages on a wafer in a mirror-polishing process. As aforementioned, for the first time the inventors of the present invention found that zinc compounds contained in a polishing pad can cause the generation of polishing damages on a wafer in a mirror-polishing process, but Cercone does not so much as recognize such a problem. Accordingly, one of ordinary skill in the art would not have been led to the present invention from Cercone.

For the foregoing reasons, Applicants submit that Cercone fails to teach or suggest the claimed invention. Reconsideration and withdrawal of this rejection are respectfully requested.

II. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully submit that claims 11-18 and 20-31 are in condition for allowance. Should the Examiner believe that anything further is needed in order to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



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Attachment:
Appendix

Date: April 29, 2003

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DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461
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APPENDIX

Changes to Claims:

The following is a marked-up version of the amended claims:

11. (Twice Amended) A polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a mirror polishing process, wherein a content of zinc oxide (ZnO) included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad.
12. (Twice Amended) A polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a finish polishing process, wherein a content of zinc oxide (ZnO) included in the polishing pad is 100ppm or less at the ratio of zinc weight relative to the weight of the polishing pad.
13. (Twice Amended) A polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a finish polishing process, wherein the polishing pad does not include zinc oxide (ZnO).
20. (Three Times ~~Twice~~-Amended) A polishing pad used for polishing a semiconductor wafer while supplying a polishing agent onto the polishing pad in a mirror polishing process, wherein it comprises a base layer formed of nonwoven fabric and a porous surface layer, and a content of zinc oxide (ZnO) included in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer.
27. (Three Times ~~Twice~~-Amended) A method for polishing a semiconductor wafer, comprising performing polishing of the semiconductor wafer with the polishing pad of Claim 11 while supplying a polishing agent onto the polishing pad.
28. (Three Times ~~Twice~~-Amended) A method for polishing a semiconductor wafer, comprising performing polishing of the semiconductor wafer with the polishing pad of Claim 12 while supplying a polishing agent onto the polishing pad.

29. (~~Three Times Twice~~ Amended) A method for polishing a semiconductor wafer, comprising performing polishing of the semiconductor wafer with the polishing pad of Claim 13 while supplying a polishing agent onto the polishing pad.

30. (~~Twice~~ Amended) A method for polishing a semiconductor wafer, comprising performing polishing of the semiconductor wafer with the polishing pad of Claim 20 while supplying a polishing agent onto the polishing pad.

31. (~~Three Times Twice~~ Amended) A method for polishing a semiconductor wafer, wherein a finish polishing is performed while supplying a polishing agent onto a polishing pad and while a concentration of zinc oxide (ZnO) is kept to 200ppm or less in a position where the semiconductor wafer is in contact with the a-polishing pad.